

measuring, along a predetermined path, beam electric currents at a plurality of measurement positions different from each other to obtain a beam transport efficiency of an ion beam; and

adjusting transport efficiency and the energy contamination.

24. (Once Amended) An ion implantation apparatus, comprising:

a table for storing measured results in necessary beam electric current values on the basis of an inverse proportion relation between a beam transport efficiency for each ion species and an amount of an energy contamination; and

means for adjusting the energy contamination of ion implantation at each necessary beam electric current value, by using a limiting beam transport efficiency value obtained on the basis of the table.

REMARKS

Claims 1-24 are pending. By this Amendment, the specification and claims 7 and 24 are amended in view of mere formal matters. No change in claim scope is intended by the amendments. No new matter is added. Applicants respectfully request withdrawal of any objection or rejection.

Applicant respectfully appreciates the indication by the Examiner that the application is in condition for allowance except for formal matters and that prosecution on the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

In view of the amendments and remarks above, Applicant submits that this application is in condition for allowance and request favorable action thereon.

In the event this paper is not considered to be timely filed, the applicant respectfully petitions for an appropriate extension of time. Any fees for such an extension, together with any additional fees that may be due with respect to this paper, may be charged to counsel's Deposit Account No. 01-2300.

Respectfully submitted,

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Enclosures: Marked-Up Copy of Amended Specification and Claims

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[0005] According to inventors' experimental studies, it has been found out that ions with undesirable energy are implanted into the wafer and give rise to serious energy contamination, when the ions are implanted into the wafer with very low energy with the conventional deceleration method. Here the "energy [contamination] contaminant" is defined as a particle that is the same kind of element as a desired ion but has different energy from the desired ion. Such a contaminant particle reaches to a deeper position of the wafer than desired. If the concentration of the contaminant particles exceeds a criterion (typically $1E18/cm^3$; depends on the structure of a semiconductor device), the junction depths are determined not by desired ions but by the **energetical** contaminant particles. Therefore, it is important to decrease the amount of the energy contamination. Because the concentration of the desired ions is fixed at an appropriate value to achieve good device-performance, the only way to reduce the amount of the energy contamination is to reduce the ratio of the energy contamination. Here the "energy contamination ratio is defined as a ratio of the number of particles implanted with an incorrect energy to the number of ions implanted with the correct energy.

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7. (Twice Amended) [The] An ion implantation method for use in an ion implantation apparatus comprising an ion source, an extraction electrode, a mass analysis unit, a mass analysis slit, and a wafer processing chamber, comprising the steps of:

deciding a target value of energy contamination in a wafer;

measuring, along a predetermined path, beam electric currents at a plurality of measurement positions different from each other to obtain a beam transport efficiency of an ion beam; and

adjusting transport efficiency and the energy contamination.

24. (Once Amended) [The] An ion implantation apparatus, comprising:

a table for storing measured results in necessary beam electric current values on the basis of an inverse proportion relation between a beam transport efficiency [in] for each ion species and an amount of an energy contamination; and

means for adjusting the energy contamination of ion implantation [in the] at each necessary beam electric current value, by using a [limit] limiting beam transport efficiency value obtained on the basis of the table.